

**STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
Honolulu, Hawaii**

September 8, 2017

Board of Land and
Natural Resources
State of Hawaii
Honolulu, Hawaii

REGARDING: Conservation District Use Application (CDUA) HA-3798 for the Proposed Establishment of a National Ecological Observatory Network (NEON) Field Study Site at the Pu'u Maka'ala Natural Area Reserve

APPLICANT: Steven Ellis, Program Director
National Science Foundation

LANDOWNER: State of Hawai'i
Division of Forestry & Wildlife

LOCATION: Upper Wai'alea and Ola'a Forest Reserves, Island of Hawai'i

TMKs: (3) 1-8-012:003; 1-9-001:001; 2-4-008:009, 019 & 025

AREA of USE: ≈ 11,660 acres

SUBZONE: Protective, Resource and General

BACKGROUND:

Pu'u Maka'ala Natural Area Reserve

According to the Department's Natural Area Reserves System webpage, the statewide Natural Area Reserves System (NARS) was established to preserve in perpetuity specific land and water areas which support communities, as relatively unmodified as possible, of the natural flora and fauna, as well as geological sites, of Hawai'i. The management of the NARS comes under the Division of Forestry & Wildlife. Within these areas one can find rare endemic plants and animals, many of which are on the edge of extinction.

Pu'u Maka'ala Reserve protects montane wet 'ohia and koa forests. A montane wet grass land ecosystem is also represented. The forest provides important habitat for some of Hawai'i's rarest birds, as well as several rare plants. As specified in the 2013 Pu'u Maka'ala NAR Management Plan, the overall management goal is to manage threats to the integrity, diversity and functioning of Pu'u Maka'ala NAR ecosystems so that the unique natural and cultural resources are protected, maintained, and enhanced.

National Ecological Observatory Network (NEON)

The National Ecological Observatory Network (NEON) is a continental-scale ecological observation facility sponsored by the National Science Foundation (NSF) and operated by Battelle Memorial Institute. It is designed to gather and synthesize data needed to study the impacts of climate change, land use change, and invasive species on natural resources and biodiversity.

NEON is comprised of a network of long-term scientific infrastructure deployments to collect high-quality, standardized data. The design divides the continental US, Alaska, Hawai'i and Puerto Rico into 20 domains. Within each domain, infrastructure is deployed to field study sites strategically selected to represent different regions of vegetation, landforms, climate, and ecosystem performance. This network of deployments forms a fully integrated continental-scale research platform. Overall, this platform enables scientists to analyze, understand, and forecast the nature and pace of biological change at scales ranging from local to continental.

DESCRIPTION OF AREA AND CURRENT USE (Exhibits 1 & 2)

The project area is located at the Pu'u Maka'ala Natural Area Reserve (NAR) within the Upper Waiākea and Ola'a Forest Reserves, Island of Hawai'i, within portions of tax map keys: (3) 1-8-012:003; 1-9-001:001; 2-4-008:009, 019 & 025. The subject area lies within the Conservation District Protective, Resource and General subzones.

Existing land uses in the area included the Kulani Correctional Facility; a NOAA radio transmitter; HELCO power lines; and support facilities for the introduction of the 'Alalā. Current public use of the Reserve includes hiking, bird watching and controlled hunting.

Access to the site is via the Stainback Hwy adjacent to the Kulani Correctional Facility gate. Power is available via an existing electrical line located at the edge of the Kulani Correctional Facility property.

Land

According to the applicant, the Pu'u Maka'ala NAR is located on the eastern, windward slopes of Mauna Loa between elevations of 2,800 to 6,229-feet. The Kulani portion of the NAR has experienced the most recent flows and is the most vulnerable to volcanic activity as it is downslope of potential eruption sites on the northeast rift zone. The different types and ages of lava flows contribute to a diverse range of soils in the area. Approximately (≈) 25 soil types have been mapped within the vicinity by the Natural Resources Conservation Service (NRCS). While a variety of wetland features, including bogs, seeps and ephemeral pools occur throughout the NAR, no wetland features are present within or immediately proximate to the proposed infrastructure or terrestrial sampling plots. The proposed site could be subject to high winds, seismic activity and erosion of the topsoil.

Historic & Cultural Resources

The application states there are no known historic properties that are listed in or determined eligible for listing in the National Register of Historic Places located within the proposed project area. Other cultural resources present in the area include the cultural landscape and the introduced 'Alalā.

Flora

The Pu'u Maka'ala Natural Area Reserve represents some of the highest quality wet and mesic native forest on the island of Hawai'i. 'Ōhi'a, Koa, Haupu'u are the dominate species. There are disturbed portions within the Reserve that were part of activities for the Correctional Facility such as former pastureland dominated by non-native grass species.

Other species in this habitat include 'Ōlapa, Kāwa'u, Pilo, Kōlea, Hō'i'o, 'Ama'u, Uluhe, Kanawao, 'Ōhā wai, Ha'iwale, Hāhā, Maile, Ālani, and 'Ōhelo. Overall, there are more than 160 endemic plant and fern species that occur within the Pu'u Maka'ala NAR. Several of these species are federally and state listed as threatened or endangered, and in some cases, critical habitat has been designated within the NAR.

Fauna

The native forest in Pu'u Maka'ala Reserve provides valuable habitat for a variety of native species, particularly forest birds. This would include 7 species of Honeycreepers ('Akiapōlā'au, 'Amakihi, 'Apapane, Alawi, 'Ākepa, 'Ō'ū, and 'I'iwi of which 5 are endangered. The NAR also provides habitat to the endangered Hawaiian Hawk (I'o) and the endangered Hawaiian goose (Nēnē). Endangered seabird species such as the Hawaiian Petrel ('Ua'u) and the Band-rump Storm Petrel ('Akē'akē) may fly over the area while travelling between the ocean and nesting areas on the upper slopes of Mauna Loa. In addition, the endangered Hawaiian crow ('Alalā) is being introduced to this area

Other native bird species that occur within the NAR include the 'Elepaio, Hawaiian Thrush ('Oma'o), Pueo, and Kōlea. The endangered Hawaiian Hoary Bat ('Ōpe'ape'a) is also present. A wide variety of invertebrate species have been documented within the NAR, including endemic insects, spiders and snails such as picture wing flies, leaf hoppers and damselflies.

PROPOSED USE (Exhibit 3, 4, 5, 6, 7 & 8)

According to the applicant, the proposed site will be utilized to provide ecological data on NEON's "Pacific Neotropical Domain" over the course of a 30-year operational period. The project may encompass 11,660 acres of the NAR, however actual ground disturbance is anticipated to be approximately 9,513-ft². Proposed site components include:

Research Tower: This is a scaffold lattice tower that would support an array of sensors to collect data on climate, canopy microclimate, and air quality. The tower would extend 10-meters above the forest canopy and would be approximately 105-feet tall. The tower would be constructed on a 6.5-ft² concrete pad. A set of stairs within the tower would provide access to the top. Four guy wires would be installed to stabilize the tower. The wires would attach toward the top of the tower but below the canopy to minimize the potential for bird strikes, and would attach to anchors located approximately 30-meters from the tower base. Minor vegetation trimming would likely be required to maintain proper clearance around the guy wires. The guy wires shall be fitted with bird flight diverters to increase the visibility of the guy wires for forest birds.

Instrument Hut: The instrument hut would be a prefabricated module that would house gas-analyzer instruments, data recording equipment, and communications and control hardware. It would be mounted on a buried concrete foundation (approximately 9' wide x 22' long) and would have a raised boardwalk (46" wide) installed around the perimeter with a 10' ramp to facilitate

delivery of equipment. The instrument hut would include a climate control system with a small drainage trench installed to collect condensation generated from the climate control system.

Soil Horizon Pit: A 6' x 6' pit would be temporarily excavated to a depth of 7-feet (or as deep as reasonably possible based on substrate conditions and depth to bedrock) to allow for inspection and research of soil horizons. The pit would be properly stabilized, covered with plywood and surrounded with construction fencing for safety purposes. Excavated materials would be stockpiled onsite, and once inspection and research activities have been completed, the pit would be backfilled.

Soil Array Plots: The soil array would include a series of 5 sequential soil plots. Each plot would be 16.4-ft² and would include a network of in-ground soil sensors. The sensors would be installed using minimally intrusive methods, as the goal is to maintain undisturbed native soil for research purposes. PVC conduits with power and communication lines would be routed to each plot in conjunction with walkways; device posts and metal arbors would be installed at the edge of each plot to support the power and communications equipment needed to operate the soil sensors.

Precipitation Gauge: The precipitation gauge would be a Double Fence Intercomparison Reference (DFIR) system. The gauge would be mounted to a pipe installed with a 2-ft diameter concrete foundation. Two concentric fences each between 5-6-ft high would be installed around the gauge, with diameters of approximately 13-ft and 26-ft respectively. To minimize impacts to native vegetation, the gauge would be located in a former pastureland dominated by grass species, so that no vegetation clearing or trimming is expected.

Electrical Equipment: Power would be obtained from an existing electrical line located at the edge of the Kulani Correctional Facility. Secondary power service would extend from an existing pole online to an auxiliary portal that would serve the research tower and instrument hut. It would also include a plug for a generator, which would only be brought onsite and used in the case of a long-term electrical system outage. A second portal would be installed to serve the precipitation gauge. From the portals, on-grade electrical and communication lines will be contained within PVC conduits and laid along an existing fence line to the instrument hut [approximately 2,520 linear feet] and through former pastureland to the precipitation gauge [approximately 600 linear feet]. The conduit would be installed above ground and would be kept in place using fiberglass uni-strut supports, placed at regular intervals and staked into the ground. Where the conduit crosses an existing road, the area would be trenched and capped with concrete.

Walkways: Designated walkways would be installed from the existing access road to the proposed infrastructure within forested habitat to provide a focused point of access and minimize the potential extent of disturbance from repeated visits for maintenance or data collection. The walkways would be approximate 2-feet wide and would consist of flexible honeycomb paver mats designed to reduce soil compaction.

Staging Area: A staging area would be installed near the research tower and instrument hut to provide for parking and staging of equipment during construction and operations. The staging area would be 40' x 40', and would consist of approximately 6" of base course underlain by geotextile fabric.

Long Term Terrestrial Sampling: A suite of terrestrial sampling protocols would be implemented on a routine basis. Sampling would occur at designated plots and grids established in locations throughout the surrounding lands. Up to 62 plots or grids, with a total footprint of approximately 650 acres would be distributed over an area of 11,660-acres. The sampling plots and grids would include the following:

- Tower Base Plots-Approximately 20-plots 16 plots measuring 400m² and 4 plots measuring 1600m²;
- Distributed Base Plots: Approximately 20 plots, each 1600m²;
- Bird Grids: Approximately 10 grids, each 250,000m²;
- Phenology Transect: Approximately 1 transect, 800m; and
- Mosquito Plots: Approximately 10 plots, each 0.25m².

The sampling plots were identified based on the current understanding of existing and future planned research or monitoring activities in the Pu'u Maka'ala Reserve, and reflect an effort to minimize redundancy or excessive activity in any given location. It is possible that the plot and grid locations may be adjusted within the limits of the project area. Once the project is operational, the goal is to keep the plot and grid locations fixed to maximize data integrity. However, there is some degree of flexibility to move individual plots or grids in response to an unanticipated impact or changed condition within the Reserve. Any such decision would be made in direct coordination with the NARs Manager.

The sampling plots and grids would be established at the same time the scientific equipment is installed and calibrated. This effort would include: 1) NEON technicians confirming the validity of each plot location; and 2) Placement of permanent markers at a fixed sample point or at the ends of a sample transect. Permanent markers would consist of rebar or survey caps (or a similar marking device approved by NARs staff) driven into the ground and would be placed only at the start of the project. If the plot or grid were to be relocated during the project, the original markers would be removed and new markers would be placed.

Over the 30-year operational period, technicians would visit each sampling plots and grid on a routine basis, as needed to conduct the prescribed sampling activities. The sampling protocols are consistent with the standardized requirements for NEON, but have been tailored as appropriate based on the local ecology and site-specific conditions. The sampling protocols are designed to be passive, with minimal ground disturbance. Certain sampling protocols require placement of sampling equipment (e.g. pitfall traps and mosquito traps).

Exhibit 10 lists the sampling frequency, duration, and timing for each of the sampling protocols. The timing for sampling activities is designed to avoid or minimize impacts, including activities during sensitive periods such as breeding season to the extent possible. Sampling visits would be combined when possible to minimize the number of times researches are at the site. It is currently expected that 3 full time staff would be needed to conduct the sampling and other operational requirements. The staff would be supplemented with up to 8 temporary technicians during peak sampling periods.

Annual Aerial Flight: An aerial flight would be conducted on an annual basis. The aerial flight would use a small aircraft with remote sensing equipment that would include a Hyperspectral Imager, Light Detection and Ranging [LIDAR] sensor, and high-resolution camera. The typical flight elevation would be 1,000-meters, but would vary based on topography. Data collected

from the flight would provide detailed spatial information on the structure and properties of vegetation.

The infrastructure associated with NEON field study would be located within the Koa/‘Ōhi‘a Montane Mesic Forest with the exception of the precipitation gauge, that would be located in former pastureland dominated by non-native grass species. The terrestrial sampling plots/grids would be distributed across montane wet and mesic forest vegetation communities. The site would be fully instrumented with standardized infrastructure and equipment designed to collect biological, biophysical, biogeochemical and land use data. All proposed infrastructure would be located adjacent to existing roads.

The data collected would be reviewed, synthesized and packaged by the NEON project team. The data would be uploaded to an online portal where it would be made available to the general public as part of the continental NEON data set. The data would also be transferred directly to NARS staff to assist with management of the Natural Area Reserve.

CONSTRUCTION ACTIVITIES

All construction activities would be conducted during daylight hours and no night work would be performed. Installation of infrastructure is expected to require approximately 5-months and installation and calibration of equipment is expected to require an additional 2-3 months.

Workers would travel to and from the project site together to minimize the number of vehicles accessing Pu‘u Maka‘ala NAR. Vehicle use would be strictly limited to the existing access road or proposed staging area, except where essential for installation of infrastructure. No new access roads would be constructed, but the existing access road may be improved to accommodate construction vehicles as allowed by the NARS Manager. Equipment and materials would be hand-carried to areas beyond the access road [e.g. soil plots], as needed.

Ground disturbing activities associated with installation of the proposed infrastructure would include excavation, grading and use of heavy equipment, which collectively could result in soil erosion. The erosion potential is low because of the relatively small area of disturbance and type of soils present. Regardless, BMPs would be implemented to minimize the potential for construction related erosion. Temporarily disturbed areas would be stabilized and revegetated as quickly as possible. **Exhibit 11** lists a number of Best Management Practices (BMP) that will be observed.

Potential Impacts of Project

The necessary construction and increased human presence during monitoring for the NEON site could adversely affect native plant and bird species present at the site. The BMPs listed were designed to avoid and minimize any environmental impacts and were developed in close consultation with stakeholders concerned with biological resources. It is expected that if additional adverse impacts are noticed, revised monitoring, research and control protocols would be enforced. Further discussions of mitigation measures are available in the Environmental Assessment.

The proposed tower is planned to be 105-feet tall. A portion of the top of the tower that extends above the forest canopy will be visible from the Kulani Correctional Facility. The NARS is open to the public. While lightly used, there is possibility that individuals using the NARS

recreationally may notice the tower. The tower is not expected to visually impact other individuals or communities.

The terrestrial sampling plots would have minimal impacts on individuals and the community. The plots would have identification markers (typically rebar or survey caps or similar marking device approved by NARs) which may be visible to visitors. Similarly, beetle pitfall trap covers may be noticed by individuals walking in the NARS. However, the trap covers will be camouflaged. Mosquito traps are proposed to be temporarily deployed near access routes. Individuals driving the roads may notice these traps during the deployment timeframes.

The proposed activities are not expected to affect any known resources. If previously unidentified archaeological resources are discovered during activities, ground disturbing activities would be halted in the vicinity and NSF would consult with the SHPD and other consulting parties as appropriate for necessary mitigation or other treatment measures.

ALTERNATIVES

Alternatives considered were to site the project in other locations with similar resource values. The original site proposed was the Lapāhoehoe Forest unit of the Hawaii Experimental Tropical Forest consisting of lands that lie within the Lapāhoehoe NAR and the Forest Reserve. Due to logistical challenges, this site was found to be unsuitable.

Another site considered is the nearby Upper Waiakea Forest Reserve. However due to the public use of the area for hunting, hiking and other recreational uses, the potential for user conflicts were high. With DOFAWs recommendation, the present site was chosen within the boundary of the NAR, where there are fewer visitations by the public and hunting is not allowed.

Under the no action alternative, no research would be done in regards to NEON's Pacific Tropical domain site. Long-term ecological data would not be collected and made available to inform ecological research and land management activities.

SUMMARY OF COMMENTS

The application was referred to the following agencies for review and comment: the State's-Department of Land and Natural Resource's Hawai'i District Land Office, Historic Preservation Division, Division of Forestry and Wildlife and the Division of Conservation and Resource Enforcement; Department of Public Safety; Office of Environmental Quality Control; Office of Hawaiian Affairs; and Department of Health; the County of Hawai'i's Department of Planning; and the Federal US Fish & Wildlife Services and the National Oceanic Atmospheric Administration. In addition, the CDUA was also forwarded to the Hawai'i Electric Light Company and the San Diego Zoo. The CDUA was also sent to the nearest public library, the Hilo State Library, to make this information readily available to those who may wish to review it.

STATE of HAWAI'I

Department of Health

In the development and implementation of all projects, the Environmental Planning Office (EPO) strongly recommends regular review of State and Federal environmental health land use

guidance. State standard comments and available strategies to support sustainable and healthy design are provided at health.hawaii.gov/epo/landuse.

EPO also encourages the use and examination of the Hawai'i Environmental Health Portal at eha-cloud.doh.hawaii.gov. This site provides links to our e-Permitting Portal, Environmental Health Warehouse, Groundwater Contamination Viewer, Hawaii Emergency response Exchange, Hawaii State and Local emission Inventory System, Water Pollution control Viewer, water Quality Data, Warnings, Advisories and Postings.

We request that you utilize all this information on your proposed project to increase sustainable, innovative, inspirational, transparent and healthy design.

Department of Land and Natural Resources

Division of Conservation and Resource Enforcement

There is no discussion regarding what will happen upon the project's completion. Given the location and nature of the project there should be a plan for removal and restoration.

Applicant's response

The nature of the site closure at the end of the 30-year operation period would be based on the interests of DOFAW. If requested, it is possible that some or all of the infrastructure or equipment may be retained on site. Although the specific decommissioning and closure plans are undefined at this time, it is assumed that all sampling infrastructure (including the tower and instrument hut) would be removed, but below-grade material would be left in place. All boardwalk materials and electrical equipment (including powerlines and conduits) would be removed. Revegetation activities would be coordinated with DOFAW and NARS staff.

Division of Forestry & Wildlife

DOFAW supports this project

Land Division

No comments

Office of Conservation and Coastal Lands

The OCCL notes there is an existing NOAA Weather Radio (NWR) communications facility within the proposed site. The NWR broadcasts official warnings and hazard information 24/7 as a public service to the community and in conjunction with various government Emergency Management agencies. Please provide information as to how the proposed use will not interfere with the existing radio communications facility.

Applicant's response

Discussion of the tower has taken place with staff of the NOAA Pacific Region. There is little concern of interference between the two towers as NEON does not transmit data over radio frequencies. However, NOAA has requested to be notified when construction starts and once sensor installation begins so that they can monitor their data for any variances.

COUNTY of HAWAI'I

Department of Planning

No comments

Department of Water Supply

No comments or objections

ANALYSIS

After reviewing the application, the Department finds that:

1. The proposed use is an identified land use in the Protective, Resource and General subzones of the Conservation District, pursuant to the Hawai'i Administrative Rules (HAR) §13-5-22, P-1 DATA COLLECTION Data collection, research, education, and resource evaluation that involves permanent facilities or structures larger than 500 square feet or a land use causing significant ground disturbance or impact to a natural resource. Please be advised, however, that this finding does not constitute approval of the proposal;
2. Pursuant to §13-5-40 of the HAR, a Public Hearing shall be required as portions of the project proposal lie within the Protective subzone of the Conservation District;
3. In conformance with Chapter 343, Hawai'i Revised Statutes (HRS), as amended, and Chapter 11-200, HAR, a finding of no significant impact to the environment (FONSI) is anticipated for the proposed project; and
4. The subject area does not appear to be in the Special Management Area.

Notice of this draft Environmental Assessment for this CDUA was published in the Office of Environmental Quality Control (OEQC) Environmental Notice on May 23, 2017; and the FONSI was published in the August 8, 2017 Environmental Notice.

A Public Hearing was held on June 29, 2017 at 6pm at the DOFAW Baseyard in Hilo at 19 E. Kāwili St. No one from the general public attended.

CONSERVATION CRITERIA

The following discussion evaluates the merits of the proposed land use by applying the criteria established in Section 13-5-30, HAR.

1. *The proposed land use is consistent with the purpose of the Conservation District.*
 - The objective of the Conservation District is to conserve, protect and preserve the important natural resources of the State through appropriate management and use to promote their long-term sustainability and the public health, safety, and welfare.

The proposed project is one component of a continental-scale ecological observation facility designed to gather and synthesize data needed to study the impacts of climate change, land use change, and invasive species on natural resources and biodiversity. The resulting data and the research that it would support would inform management and long-term sustainability of the natural environment within the Reserve as well as throughout Hawai'i.

2. *The proposed land use is consistent with the objectives of the subzone of the land on which the use will occur.*

The objective of the Protective subzone is to protect valuable natural and cultural resources in designated areas such as restricted watersheds, marine, plant, and wildlife sanctuaries, significant historic, archaeological, geological, and volcanological features and sites, and other designated unique areas.

The objective of the Resource subzone is to develop, with proper management, areas to ensure sustained use of the natural resources of the area.

The objective of the General subzone is to designate open space where specific conservation uses may not be defined, but where urban use would be premature.

The proposed use is an identified land use within the Protective subzone. No construction activities are proposed within the Protective subzone. Only sampling plots are proposed within the protective subzone. The NEON project will provide valuable data that will help inform us of the condition of the forest. Plots will be placed to reduce impact and to avoid sensitive resources. The monitoring of sampling plots would provide data regarding the re-establishment of endangered plants and insects, and the detection of invasive species. The project should not interfere with existing land uses.

The proposed tower, hut, their supporting infrastructure, partial soil array plots and sampling plots are located within the Resource subzone.

The DFIR [Precipitation gauge] its supporting infrastructure, partial soil array plots, and sampling plots are proposed in the General subzone. The DFIR's design parameters are set by the world Meteorological Organization (WMO) and it needs a wide open space to properly measure precipitation without wind-induced flow distortion.

3. *The proposed land use complies with provisions and guidelines contained in Chapter 205A, HRS, entitled "Coastal Zone Management," where applicable.*

The Coastal Zone Management Area of Chapter 205A, HRS encompasses most land, water and marine areas of the State. Staff believes the proposed use will not affect recreational or historic resources; nor will the project affect the public's scenic and open space resources. The project related infrastructure would have a minimal footprint and is not expected to diminish the overall visual quality of this open space.

4. *The proposed land use will not cause substantial adverse impacts to existing natural resources within the surrounding area, community, or region.*

Avoidance and minimization of impacts to natural resources is fundamental to the long-term success of the proposed project, as it is intended to monitor natural changes in native ecosystems. The infrastructure for the proposed project would have a very small footprint (≈ 0.25 -acre), and stringent impact avoidance and minimization measures would be implemented throughout construction and operation of the proposed project. As such, impacts to natural resource are expected to be minimal and is believed to far outweigh the

long-term benefits related to ecological research and management. Staff believes the proposed land use will not substantially cause adverse impacts to the existing natural resources within the surrounding area.

5. *The proposed land use, including buildings, structures and facilities, shall be compatible with the locality and surrounding area, appropriate to the physical conditions and capabilities of the specific parcel or parcels.*

The proposed project would involve installation of research infrastructure and long-term terrestrial sampling. The proposed locations of the project components were identified in coordination with DOFAW and NARs staff, such that they would be located in areas with suitable physical conditions and capabilities. The infrastructure siting process focused on meeting the constructability and scientific requirements for the project, while balancing land use and management goals and minimizing the potential for impacts to sensitive resources within the Reserve.

6. *The existing physical and environmental aspect of the land, such as natural beauty and open space characteristics, will be preserved or improved upon, which ever is applicable.*

The project would introduce built elements into an otherwise natural environment, but would be designed to have the smallest possible footprint and to blend into the surrounding environment. In general, built components are not expected to be visible from surrounding areas. The top of the tower would extend $\approx 10\text{m}$ above the existing forest canopy and may be visible from very limited viewpoints, but is not expected to be a prominent feature that diminishes the aesthetics of the landscape.

7. *Subdivision of the land will not be utilized to increase the intensity of land uses in the Conservation District.*

No subdivision of land is proposed for this project.

8. *The proposed land use will not be materially detrimental to the public health, safety and welfare.*

Neither the construction nor the operation of the proposed project is expected to be materially detrimental to public health, safety, and welfare. The proposal would be located in a relatively remote area that is seldom accessed by the general public.

Cultural Impact Analysis

There does not appear to be any cultural uses or practices that are currently known to occur within the area of potential effect or other portions of the NARs. There are individual species in the Reserve that can be considered culturally or spiritually significant such as the 'Alalā or 'I'o both regarded as 'Aumakua. Traditionally, areas of the NAR were used to build bird-catcher's shelters, canoes, trails, and trailside resting places and shelters.

NAR staff was interviewed to identify any known cultural sites or practices. Staff indicated that cultural practices were not encountered during routine management activities. NAR administrative rules specify the need for a permit to conduct cultural practices within the NAR.

During the processing of this application, no comments in regards to traditional or cultural were received from native practitioners. The Division of Historic Preservation and the Office of Hawaiian Affairs did not provide any comments nor were any comments received from the general public regarding native and/or traditional uses that may be infringed upon. To the extent to which traditional and customary native Hawaiian rights are exercised, the proposed action does not appear to affect traditional Hawaiian rights; it is believed that no action is necessary to protect these rights.

Staff believes valued cultural, historical or natural resources customarily or traditionally used by native Hawaiian's will not be adversely affected within the Conservation District should this land use be approved. The project will be conditioned that if cultural finds are discovered, all work will cease and the Historic Preservation Division will be notified.

DISCUSSION

The proposed project is designed to provide long term data to address key issues related to ecological research and management, which are considered critical to long-term resource conservation and protection. Project-related impacts to natural resources would be monitored and are expected to be minimal.

On July 31, 2017, The Natural Area Reserve Commission approved the establishment of a long term monitoring tower and on the ground ecological studies throughout the 30 year life of the project at the Reserve; with the proviso that an annual report be submitted before the end of each permit year to assess whether there need to be any changes (additions or deletions) to the on the ground research so that conditions may be amended and attached to the original 30-year Master Special Use Permit.

The Pu'u Maka'ala Natural Area Reserve was chosen as the most suitable site based upon security, habitat, fenced perimeter and access to an existing power source. As specified in the 2013 Pu'u Maka'ala NAR Management Plan, the overall management goal is to manage threats to the integrity, diversity and functioning of Pu'u Maka'ala NAR ecosystems so that the unique natural and cultural resources are protected, maintained, and enhanced.

According to the applicant, data would be transferred directly to NARs staff to assist with management of the Natural Area Reserve. Long term research as proposed in this CDUA is necessary to identify how to best conserve, protect, and preserve our important natural resource.

Due to other projects in the area, it is imperative that there is clear communication with NARS staff and other project stakeholders. Staff notes the Natural Area Reserve Manager has the final say on all proposals and management activities of the Pu'u Maka'ala NAR.

RECOMMENDATION

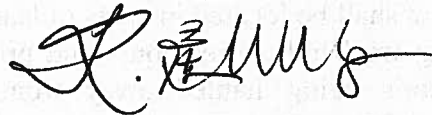
Based on the preceding analysis, staff recommends that the Board of Land and Natural Resources APPROVE Conservation District Use Application HA-3798 for the Establishment of a National Ecological Observatory Network (NEON) Field Study Site at the Pu'u Maka'ala Natural Area Reserve, Upper Wai'alea and Ola'a Forest Reserves, Island of Hawai'i, TMKs: (3) 1-8-012:003; 1-9-001:001; 2-4-008:009, 019 & 025 subject to the following conditions:

1. The permittee shall comply with all applicable statutes, ordinances, rules, and regulations of the federal, state, and county governments, and applicable parts of this chapter;
2. The applicant shall be liable, to the extent allowed by the Federal Tort Claims Act, for claims for personal injuries or property damage resulting from the negligent or wrongful act or omission of any employee of the United States while acting within the scope of his or her employment, arising out of this agreement;
3. The permittee shall comply with the Natural Area Reserve Special Use Permit;
4. The permittee shall comply with all applicable department of health administrative rules;
5. Before proceeding with any work authorized by the department or the board, the permittee shall submit two copies of the construction plans and specifications to the chairperson or an authorized representative for approval for consistency with the conditions of the permit and the declarations set forth in the permit application. One of the copies will be returned to the permittee. Plan approval by the chairperson does not constitute approval required from other agencies;
6. Unless otherwise authorized, any work or construction to be done on the land shall be initiated within one year of the approval of such use, in accordance with construction plans that have been signed by the chairperson, and shall be completed within three years of the approval of such use. The permittee shall notify the department in writing when construction activity is initiated and when it is completed;
7. All representations relative to mitigation set forth in the accepted application and environmental assessment or impact statement for the proposed use are incorporated as conditions of the permit;
8. All guy wires shall be fitted with bird flight diverters or the latest technology to increase the visibility of the guy wires for avifauna;
9. The applicant shall plan to minimize the amount of dust generating materials and activities. Material transfer points and on-site vehicular traffic routes shall be centralized. Dusty equipment shall be located in areas of least impact. Dust control measures shall be provided during weekends, after hours and prior to daily start-up of project activities. Dust from debris being hauled away from the project site shall be controlled. Landscaping and dust control of cleared areas will be initiated promptly;
10. The permittee shall notify the Office of Conservation and Coastal Lands (OCCL) in writing prior to the initiation and upon completion of the project;
11. Should historic remains such as artifacts, burials or concentration of charcoal be encountered during construction activities, work shall cease immediately in the vicinity of the find, and the find shall be protected from further damage. The contractor shall

immediately contact SHPD (692-8015), which will assess the significance of the find and recommend an appropriate mitigation measure, if necessary;

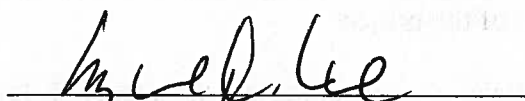
12. The permittee shall utilize Best Management Practices as noted in **Exhibit 11** for the proposed project;
13. The permittee understands and agrees that the permit does not convey any vested right(s) or exclusive privilege;
14. In issuing the permit, the department and board have relied on the information and data that the permittee has provided in connection with the permit application. If, subsequent to the issuance of the permit such information and data prove to be false, incomplete, or inaccurate, this permit may be modified, suspended, or revoked, in whole or in part, and the department may, in addition, institute appropriate legal proceedings;
15. Where any interference, nuisance, or harm may be caused, or hazard established by the use, the permittee shall be required to take measures to minimize or eliminate the interference, nuisance, harm, or hazard;
16. During construction, appropriate mitigation measures shall be implemented to minimize impacts to off-site roadways, utilities, and public facilities;
17. All exterior lighting shall be shielded to protect the night sky;
18. The permittee acknowledges that the approved work shall not hamper, impede, or otherwise limit the exercise of traditional, customary, or religious practices of native Hawaiians in the immediate area, to the extent the practices are provided for by the Constitution of the State of Hawaii, and by Hawaii statutory and case law;
19. Upon completion of the project, project components are to be removed and the land restored to the satisfaction of the Pu'u Maka'ala Natural Area Reserve Manager; and
20. Failure to comply with any of these conditions shall render this Conservation District Use Permit void under Chapter 13-5, as determined by the chairperson or board.

Respectfully submitted,



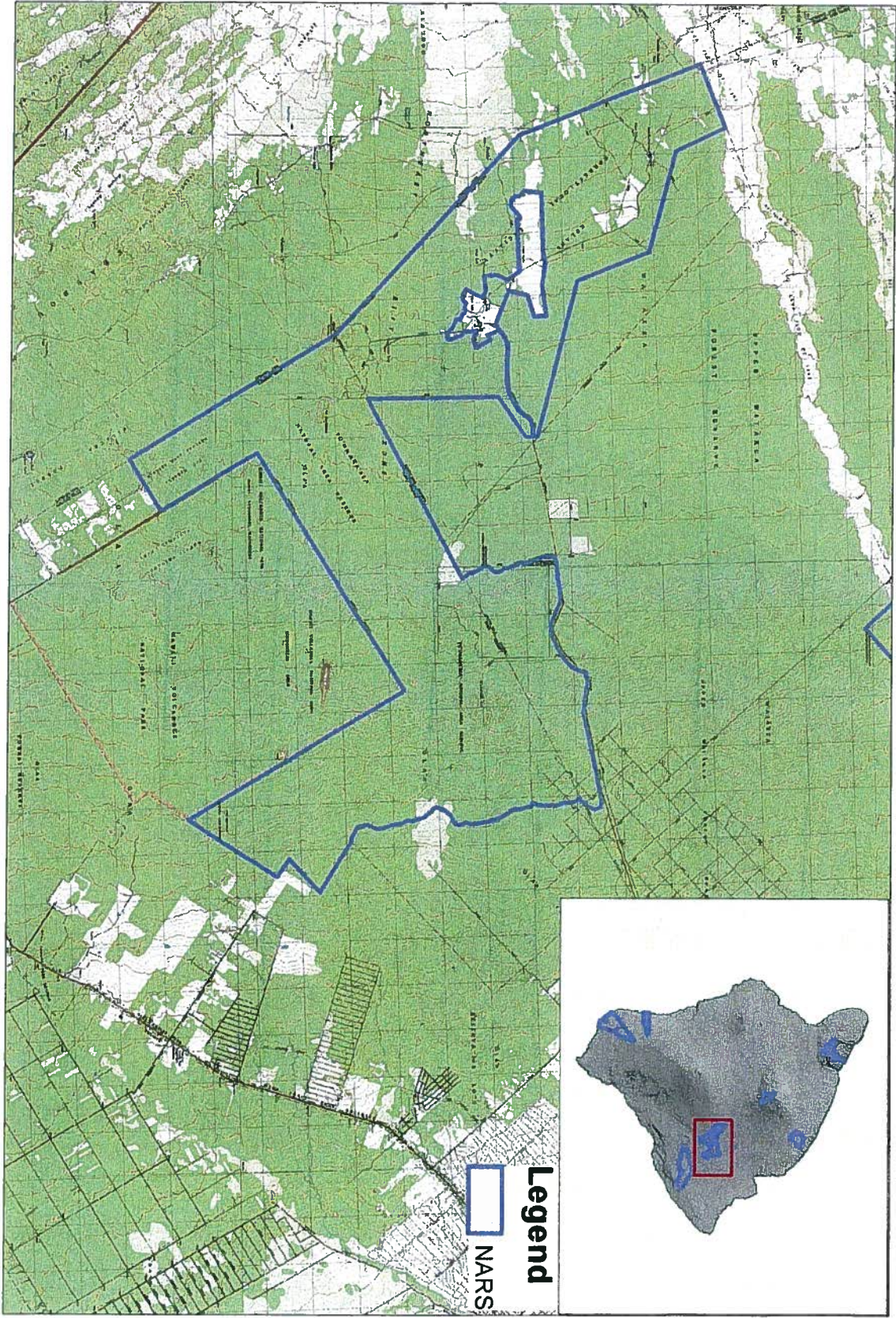
K. Tiger Mills, Staff Planner
Office of Conservation and Coastal Lands

Approved for submittal:



Suzanne D. Case, Chairperson
Board of Land and Natural Resources

Pu'u Maka'ala Natural Area Reserve



EXHIBIT



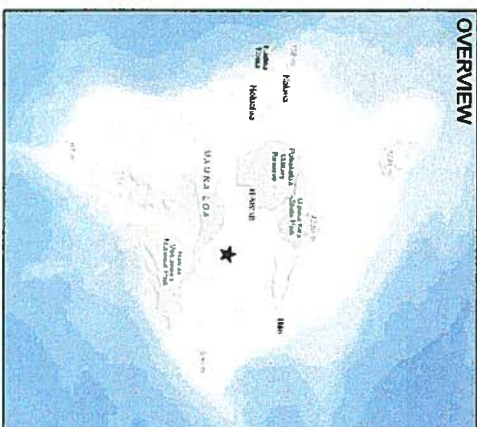
neon

NEON is sponsored by the National Science Foundation and operated under a cooperative agreement by Battelle



PU'U MAKA'ALA NATURAL AREA RESERVE DOMAIN 20 PACIFIC TROPICAL

OVERVIEW



Legend

- Tower
- Instrument Hut
- DIFR
- Power
- Staging Area
- Proposed Sampling Plots and Grids
- Conservation District Subzones
- Pu'u Maka'ala NAR
- Ongrade Electrical Conduit
- Boardwalk
- Construction Survey Boundary
- Terrestrial Sampling Boundary
- General
- Protective
- Resource
- Distributed Base Plot
- Distributed Bird Grid
- Distributed Mosquito Point
- Tower Base Plot
- Tower Phenology Plot

0 0.475 0.95 1.9 2.85 3.8
Kilometers

WGS 1984 UTM Zone 05N

April 2017

BATTELLE

EXHIBIT 3

Photos of Pu'u Maka'ala Natural Area Reserve Kulani Site Inspection October 26, 2016



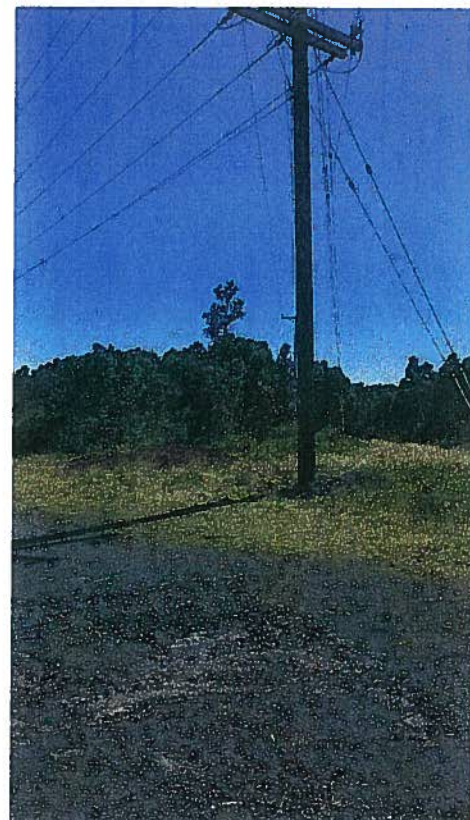
Research Tower Site



A Survey Area



Instrument Hut Site



Existing Infrastructure

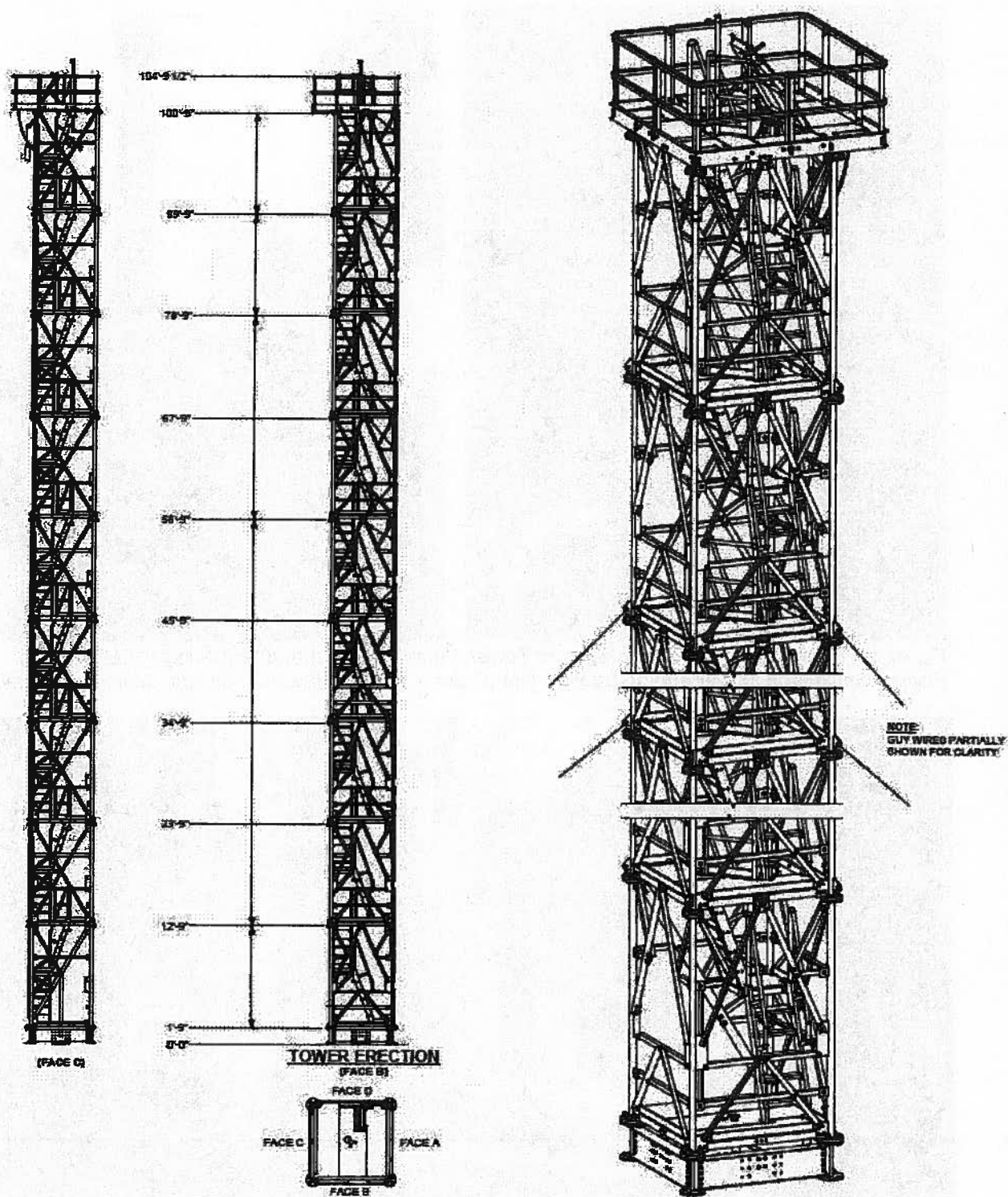


EXHIBIT 5

Schematic Diagram of Proposed Research Tower

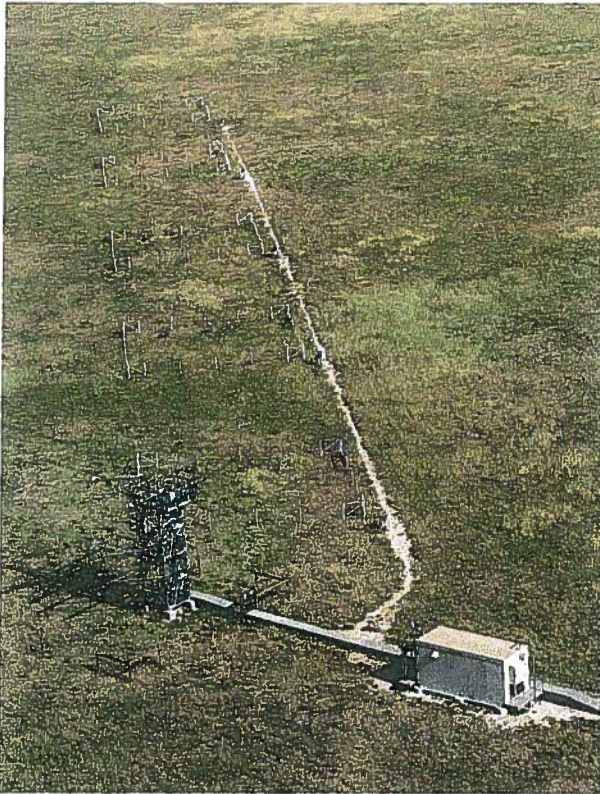


Figure 4c. Representative Photographs of Tower, Instrument Hut and Soil Array (CPER, Central Plains Domain) and Tower and Instrument Hut (Ordway Swisher Biological Station, Southeast Domain)



Figure 4d. Representative Photograph of Instrument Hut (Jones Ecological Research Center, Southeast Domain)



Figure 4e. Representative Photographs of Walkway, Electrical Conduit and Device Post (left) and Arbors Supplying Power to Soil Plots (right) (Oak Ridge National Laboratory [ORNL], Appalachian & Cumberland Plateau Domain)



Figure 4f. Representative Photographs of Soil Sensor Equipment (CPER, Central Plains Domain)

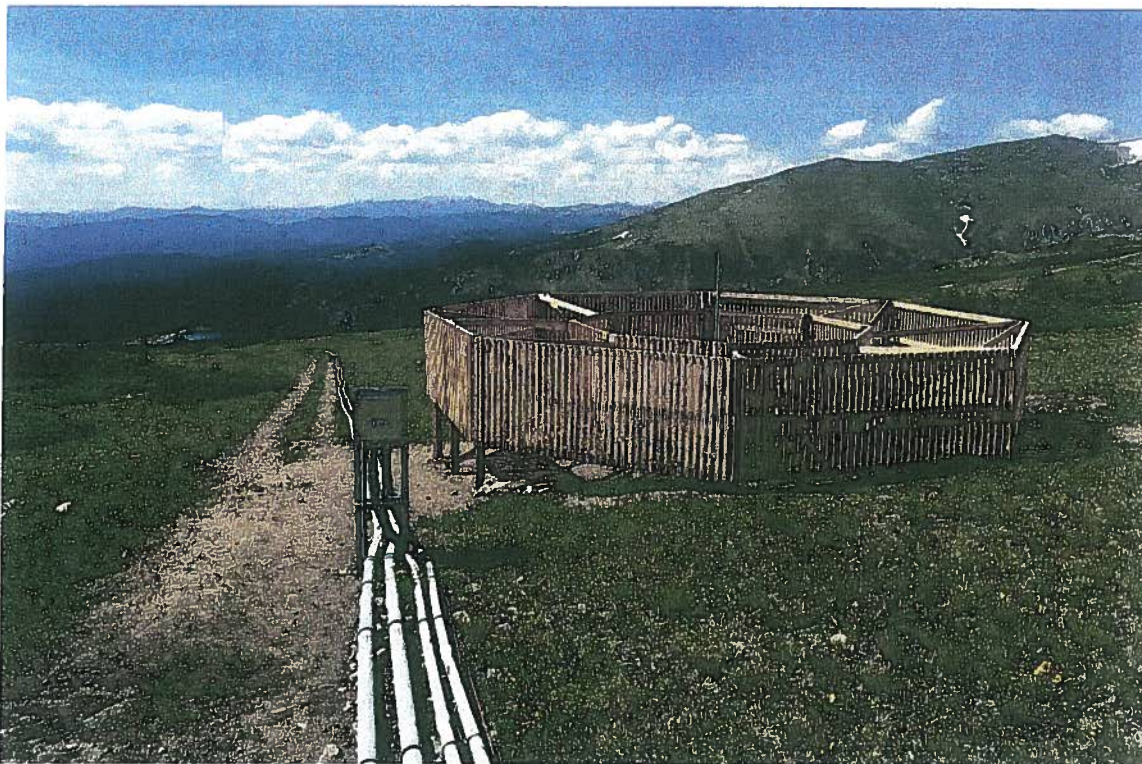


Figure 4g. Representative Photograph of DFIR Precipitation Gauge with On-Grade Conduit and Device Post (*Niwot Ridge, Southern Rockies & Colorado Plateau Domain*)

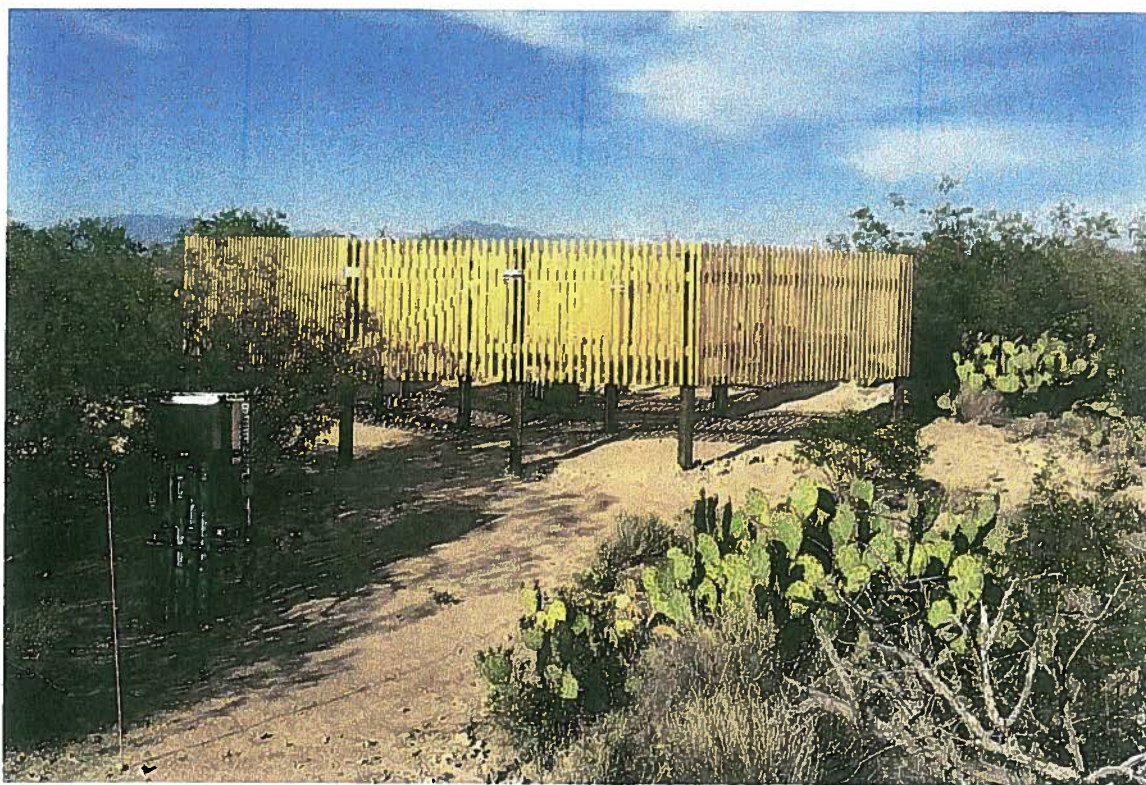
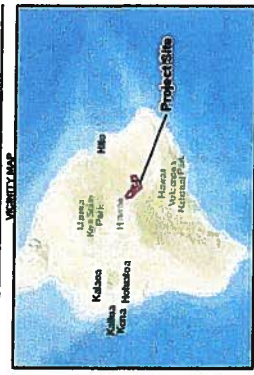


Figure 4h. Representative Photograph of DFIR Precipitation Gauge and Device Post (*Santa Rita Experimental Range, Desert Southwest Domain*)



- LEGEND**
- Precipitation Gauge
 - Tower
 - Instrument Hut
 - Staging Area
 - Soil Horizon
 - Soil Array
 - Existing Power Pole
 - Power Drop from Existing Power Pole
 - On-grade Electrical Conduit
 - Boardwalk
 - Existing Access Road
 - Extent of Potential Construction Activities
 - Extent of Potential Terrestrial Sampling
 - Tax Map Key (TMK)
 - Pu'u Maka'ala Natural Area Reserve
 - Proposed Sampling Plots and Grids
 - Tower Plot (Center Point)
 - Distributed Plot (Center Point)
 - Bird Grid (Center Point)
 - Phenology Transect (Center Point)
 - Mosquito Point

NOTE: It is possible that individual plot or grid locations may be adjusted within the limits of the proposed project area. Any adjustment in plot or grid location would be coordinated with DOP/INMARS.

Aerial Source: NAIP, 2016

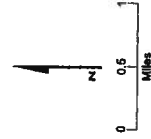


Figure 2
 Pu'u Maka'ala (Domain 20) Core Tower
 and Sampling Site
 National Ecological Observatory Network
 (NEON) Project
 Hawaii Island, Hawaii

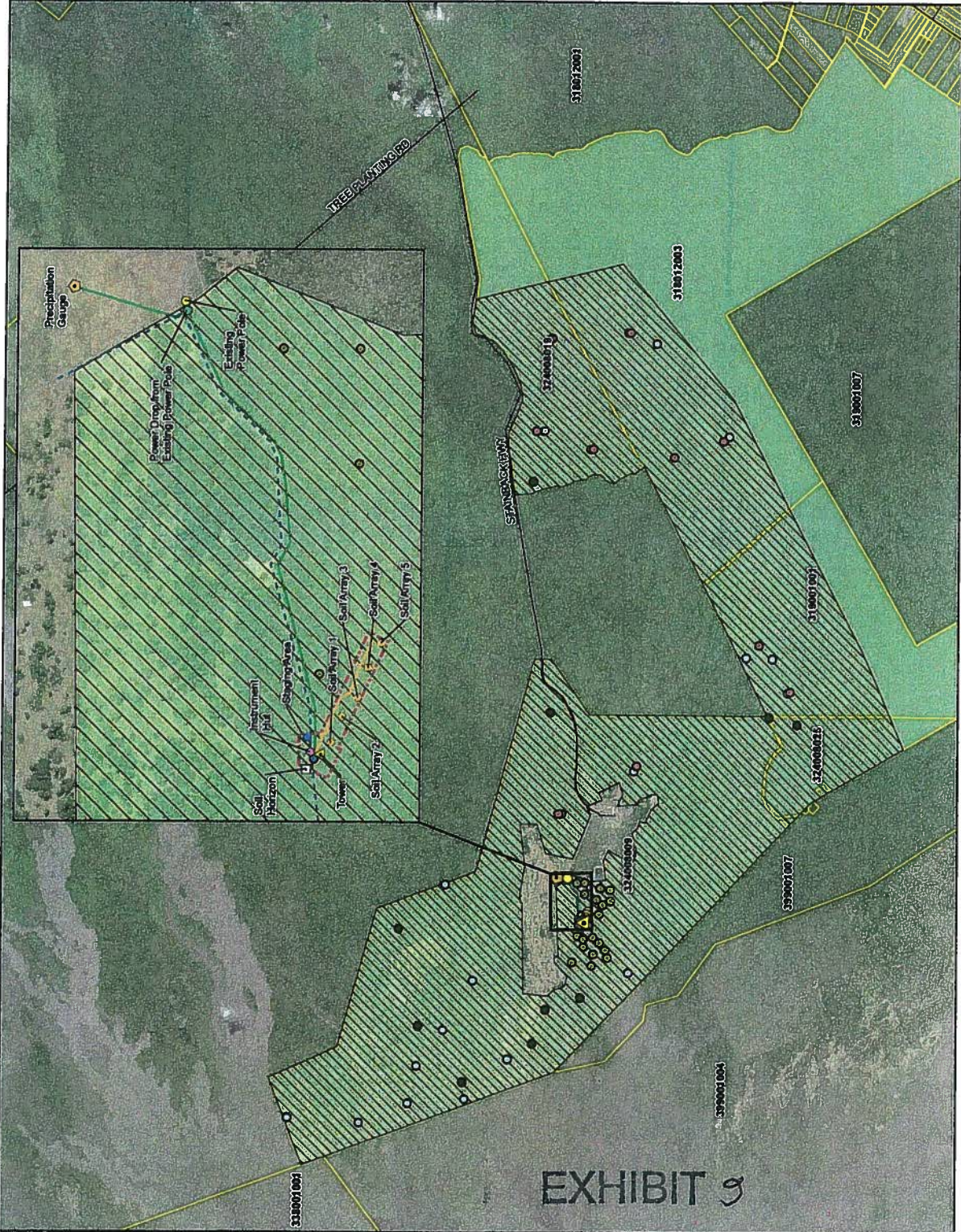


TABLE 3
Summary of Proposed Terrestrial Sampling Protocols

DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

Type of Sampling	Description of Proposed Field Sampling Activity		Equipment Installed	Plot/Grid Location	Sampling Season	Frequency	Duration of Each Event	Number of Visits to Each Plot per Event	Number of Technicians per Visit
Soil sampling	Three soil samples will be collected at each plot (to a depth of 30 cm or refusal) and until 300 g is collected, and diameter ranging between 3.5 and 11 cm; holes will be backfilled at NANS direction.	Soil microbes and soil biogeochemistry; ¹ N transformations	None	Tower plots (4); Distributed plots (6)	October, January, April	3 events per year	4-5 days (2-3 plots a day)	1	2
Plant diversity	Observations of species presence and cover (at 1 m ²) will be made in 400-m ² multi-scale plots. Observations within these plots are made at eight 1- and 10-m ² subplots. Vouchers of a subset of representative plant species (approximately 20 per year) will be collected.		None	Tower plots (3) Distributed plots (20)	January-February	1 event per year	2-3 days (1-2 plots per day)	1	2
Litterfall and fine woody debris	Litter (from living plant material) will be collected from basket-like traps and from paired ground traps for woody material <2 cm in diameter, arrayed in 20-m x 20-m plots.		One 0.5-m ² PVC elevated trap per plot (0.8 m off the ground), and one 1.5-m ² ground trap per plot	Tower plots (20)	Year-round	Elevated traps: 26 events per year Ground traps: One event per year	1 day (20 plots per day)	1	2
Belowground fine root biomass	Two soil cores (7.62 cm in diameter, 30 cm deep) will be extracted from each plot to measure fine root live and dead biomass; holes will be backfilled at NANS direction.		None	Tower plots (20)	January-February	1 event every 5 years	5-10 days (2-4 plots per day)	1	2
Vegetation structure	Measurements such as height and diameter at breast height of woody individuals will be measured. No collection will be made (unless diagnostic plant parts needed to facilitate species identification).		Aluminum tags hung around woody vegetation with loose wire (no nails would be used)	Tower plots (20) Distributed plots (20)	Any time ² Any time ²	1 event per year 1 event every 3 years	10-20 days (0.5-1 day per plot)	1	2
Coarse downed wood (ally)	Nondestructive tally measurements will be made along three 200-m transects originating from within each plot.		Log tags	Tower plots (20) Distributed plots (20)	July-September July-September	1 event every 3 years 1 event every 3 years	20 days (1 plot per day) 20 days (1 plot per day)	1	2
Coarse downed wood (density)	Disks (5-10 cm width) will be cut from downed logs using a chainsaw or hand-powered bucksaw. A total of 100-200 disks will be cut; the final number will be dependent on the number of taxa and the number of decay classes encountered.		Log tags	Area surrounding tower	July-September	2 events total: once in first 3 years and again 5-6 years later	20 days (1 plot per day)	1	2
Canopy foliar chemistry	Sunlit leaves of dominant species will be harvested using a compressed air line-launcher.		None	Distributed plots (20)	July-September	2 events total: once in first 3 years and again 5-6 years later	20 days (1 plot per day)	1	2
Leaf area index	Digital hemispherical photographs of understory and overstory vegetation will be taken at multiple points within each plot.		None	Tower plots (3) Distributed plots (20)	January-February January-February	1 event every 5 years 1 event every 5 years	4 days (1 plot per day) 6 days (1 plot per day)	1	2
Herbaceous biomass	Herbaceous material will be clip harvested from one 0.2-m (0.1-m x 2-m) area.		None	Tower plots (20)	August-September	1 event per year	5-10 days (2-4 plots per day)	1	2
Plant phenology	Phenological status and transitions of plant species will be monitored and recorded. Initially, up to 30 individuals of 3 species will be monitored. Over subsequent years, fewer individuals of 20 species will be monitored.		Aluminum tags wrapped around woody vegetation with loose wire, markers inserted in ground for herbaceous vegetation	Phenology transect (1); Distributed plots (10)	Year-round	1 event every 2 weeks (26 events per year)	1 day (1 transect per day)	1	2
Ground beetles	Four pitfall traps at each plot will be deployed and checked at 2-week intervals to capture and describe the diversity and abundance of ground beetles.		Four pitfall traps per plot; each trap consists of a cup buried flush with the ground, filled with a preservative, and shaded by a flat cover	Distributed plots (10)	October-April	13 events per year	1 day every 2 weeks	1	2
Mosquitoes	CO ₂ traps will be deployed for 2 nights (approximately 40 consecutive hours) per sampling event; captured mosquitoes will be retrieved from the trap on three occasions (first morning, second evening, and second morning).		Trap consisting of small insulated cooler (loaded with CO ₂ pellets), rain cover, a fan (with 6-volt battery), and catch cup; trap will be hung from a tree or post	Mosquito points (10), each within 35 m of road	Year-round	1 event per month (12 events per year)	2 days	4	2
Birds	Bird abundance and diversity data will be collected using binoculars and laser rangefinder; point counts will be conducted for a total of 10 minutes per location		None	Bird grids (10)	February-March	1 event every three years	5-10 days (1-2 grids per day)	1	2

Notes:
¹ Soil biogeochemistry analyses will be conducted on a subset of soil collection every 3 years.
² Timing will be determined in consultation with site host.

cm = centimeter
g = gram
m = meter
m² = square meter

If the project involves landscaping, please describe how the landscaping is appropriate to the Conservation District (*e.g. use of indigenous and endemic species; xeriscaping in dry areas; minimizing ground disturbance; maintenance or restoration of the canopy; removal of invasive species; habitat preservation and restoration; etc.*)

The proposed project will not involve landscaping.

Please describe **Best Management Practices** that will be used during construction and implementation of the proposed land use.

The following BMPs will be implemented:

1. The NEON project would follow the biosecurity (decontamination) protocols outlined by the DOFAW NARS.
2. Tools used for cutting infected ohia trees should be cleaned with a 70% rubbing alcohol solution (or 10% bleach solution as long as tools are oiled afterward)
3. Vehicles used off-road in infected forest areas should be thoroughly cleaned. The tires and undercarriage of the vehicle should be cleaned with detergent if they have travelled from an area with ROD or travelled off-road.
4. Shoes and clothing used in infected forests should be cleaned. Shoes should be decontaminated by dipping the soles in 10% bleach or 70% alcohol solution. Other gear can be sprayed with the same solution. Clothing can be washed in hot water and detergent.
5. Wood of affected ohia trees should not be transported to other areas of the Hawaiian Islands or interisland. All cut wood should be left on-site to avoid spreading the disease. The pathogen may remain viable for over a year in dead wood. The HDOA has passed a new quarantine rule that prohibits interisland movement, except by permit, of all ohia plant or plant parts.
6. All construction vehicles and equipment would be maintained in proper tune according to manufacturer's specifications.
7. The number of vehicles accessing and moving within the project area would be limited to the extent possible. Vehicles speed on unpaved roads within the proposed project area would be limited to 15 miles per hour or less.
8. Vehicles and equipment would not be allowed to idle for extended periods of time (i.e., greater than 20 minutes).
9. The extent of ground disturbance would be minimized where possible. Temporarily disturbed areas would be stabilized and revegetated as quickly as possible.
10. All trucks hauling soil or other loose materials would be covered.
11. The entrance to the proposed project site would be stabilized to avoid offsite tracking of sediment.

EXHIBIT 11

12. Construction equipment would be properly tuned and balanced, and maintenance would be performed in accordance with the manufacturer's specifications.
13. Noise barriers, mufflers, or both would be used on diesel and gasoline engines.
14. Construction activities would be restricted to typical working days/hours.
15. Unnecessary noise would be kept to a minimum.
16. Erosion and sediment control measures (for example, silt fences) would be installed before earth moving activities are initiated, and would be inspected and properly maintained throughout the construction period.
17. Disturbance of soil would be minimized during periods of heavy rain.
18. Vehicles and equipment would be inspected for leaks and contamination on a daily basis.
19. In the event of a spill or leak of fuel or lubricants from onsite equipment, the materials would be cleaned in a timely manner and disposed of at an approved site.
20. Preconstruction surveys would be conducted throughout the construction limits. In the event that a protected plant species is identified, the NEON project team would work directly with DOFAW and NARS staff to adjust the construction limits or implement design modifications to avoid potential impacts.
21. Temporary protective fencing would be erected around any protected plant species located in close proximity to the access road or construction limits.
22. Vehicles, equipment, materials and boots would be inspected for foreign matter (including dirt, seeds, eggs, larvae or other propagules) before entry into the site, then would be cleaned to remove all foreign matter.
23. All workers would be instructed on specific procedures to prevent the introduction and spread of invasive species in the project area.
24. All trash, including food waste, would be placed into appropriate containers, removed from the project site, and properly disposed.
25. NEON domain staff would conduct regular monitoring for invasive species within the project area throughout the operational period. If invasive species are detected, removal and control would be coordinated with the NARS site manager.
26. A biologist familiar with the nesting behavior of the nēnē would survey suitable habitat within the construction area before the initiation of any construction activities, or after any subsequent delay in work of 3 or more days (during which time, the birds could attempt nesting). If a nest is discovered, USFWS would be contacted.
27. All NEON staff would be trained to identify nēnē, 'ō (Hawaiian Hawk), and 'alalā and know the appropriate steps to take if the species are present within the project area or encountered in transit to sampling locations.

28. If a nēnē is encountered within the project area, the bird would not be approached, and all activities within 100 feet of the bird would cease until the bird leaves the area of its own volition.

29. If a nēnē is encountered while in transit to a sampling location, the researcher(s) would stop and remain in place until the bird moved more than 100 feet from the travel route of its own volition or slowly retreat and return for sampling at a later time.

30. A maximum speed limit of 15 miles per hour (mph) would be enforced for all project vehicles traveling within the project site, to minimize potential collisions with nēnē.

31. Vegetation clearing or construction would not be conducted during the Hawaiian hawk breeding season (March through September). If it is not possible to avoid vegetation clearing or construction during these months, a nest survey would first be conducted by a qualified biologist. The survey would be conducted no more than 14 days before the start of vegetation clearing or construction, and would include all areas within 1,600 feet of the construction area. Appropriate survey methodology (including avoidance and minimization measures in the event a nest is found) would be coordinated with USFWS.

32. If vegetation clearing or construction occurs during the honeycreepers breeding season (February through July), a nest survey would first be conducted by a qualified biologist. The survey would be conducted no more than 14 days before the start of vegetation clearing or construction, and would include all areas within 500 feet of the construction area. Appropriate survey methodology (including avoidance and minimization measures in the event a nest occurs) would be coordinated with USFWS.

33. If vegetation clearing or construction occurs during the 'ālalā breeding season (February through July), a nest survey would first be conducted by a qualified biologist. The survey would be conducted no more than 14 days before the start of vegetation clearing or construction, and would include all areas within 1,600 feet of the construction area. Appropriate survey methodology (including avoidance and minimization measures in the event a nest occurs) would be coordinated with USFWS.

34. The use of shiny materials would be minimized and shiny surfaces would be masked to decrease their attractiveness to 'ālalā. Specifically, the tower would be constructed of materials that are a dull, galvanized gray. An exterior treatment involving dark/dull colors would be added to any shiny surfaces, such as power boxes and communication equipment.

35. All trash would be placed into appropriate containers and promptly removed from the project site, to avoid inadvertent discarding of shiny materials or other items that may be of interest to 'ālalā.

36. The guy wires for the research tower could be fitted with bird flight diverters, as needed, to increase their visibility to birds.

37. The beetle traps would be fitted or retrofitted, depending on timing of 'ālalā releases, with chicken wire to limit the extent to which 'ālalā could access the traps. Any preservatives used in the beetle traps would be verified to be non-toxic to birds.

38. Construction activities would be restricted to daylight hours to avoid the use of nighttime lighting that could attract seabirds.

39. Installation of outside lighting would be avoided, to the extent possible. If outside lights are required for safety or security purposes, directional lighting or shielded lighting would be used to prevent upward radiation. The shields would be completely opaque, sufficiently large, and positioned so that the bulb is only visible from below. Outside lights that are not needed for security and safety would be turned off from dusk through dawn during the seabird fledging season (September 15 to December 15).

40. The guy wires for the research tower would not extend above the top of the tree canopy to minimize the potential for bird strikes.

41. No trees taller than 15 feet would be trimmed or removed as a result of this proposed project between June 1 and September 15, when juvenile bats that are not yet capable of flying may be roosting in the trees. However, if a limited number of trees need to be trimmed or removed during that time period, a qualified biologist would use appropriate protocols to ensure no juvenile bats are in the affected trees before trimming or cutting.

42. No loulou or wet montane forest habitat would be cleared or trimmed, nor would vegetation biomass be harvested as part of sampling within areas that are designated critical habitat for *Drosophila muli*. If loulou is to be cleared, trimmed or harvested in portions of the project area that are not within designated critical habitat, they would first be inspected for *Drosophila muli* by a qualified biologist. If *Drosophila muli* are found, the NEON project team would work directly with DOFAW and NARS staff to adjust the construction limits or implement design modifications to avoid impacts to the occupied loulou. Protective fencing would be installed around the occupied loulou, as appropriate.

43. Mosquito traps would not be installed within 1,000 feet of critical habitat for *Drosophila muli* or any location where the species was previously documented within Pu'u Maka'ala NAR.

Please describe the measures that will be taken to mitigate the proposed land use's environmental and cultural impacts.

Cultural: The proposed activities are not expected to affect any known resources. If previously unidentified archaeological resources were discovered during project activities, ground-disturbing activities would be halted in the vicinity of the find and NSF would consult with the State Historic Preservation Division and other consulting parties, as appropriate, regarding eligibility for listing in the NRHP, project effects, necessary mitigation, or other treatment measures. An unanticipated discovery plan would be in place before initiating project activities to address any archaeological resources that might be discovered.

Environmental: The necessary construction and increased human presence during monitoring from the proposed NEON site could adversely affect native plant and bird species present at the site. The BMPs listed above were designed to avoid and minimize any environmental impacts and were developed in close consultation with stakeholders concerned with biological resources.

With regard to cumulative effects, while the Kūlani Correctional Facility would also involve substantial human activity, the facility has limited native habitat and expected impacts to biological resources are expected to be minimal. The other identified activities (DOFAW activities in the NAR and the 'Alalā Project) would also increase human activity, but would be restricted to trained natural resource personnel, whose objective is to protect the biological resources at the site. For